considerations, the practical upper frequency limit for desirable MSS operations is 500 MHz.

4.2.3 Inter-service Sharing. The most important single criterion for frequency selection is that the mobile satellite service be able to share in allocated bands without adversely impacting existing users. Bands that are currently allocated to both fixed and mobile services are potentially suitable. The NGSO MSS proponents believe that an allocation of co-primary status is important for the provision of these services and, by using sharing techniques and appropriate coordination procedures, will allow successful coexistence with current types of uses.

Shared operation in bands with existing users requires MSS below 1 GHz systems to incorporate means to protect existing services while maintaining the ability to provide their own service. The protection of existing users is an inherent part of these systems' design with the objective of minimizing the possibility of adversely impacting existing services.

The sharing ability of non-geostationary MSS systems has been documented in theoretical studies and actual field tests. For example, the conclusion that MSS below 1 GHz ~~NGSO MSS~~ systems can effectively share with mobile users is supported by recommendation ITU-R M.1039 (Method for Evaluating Sharing Between Stations in the Mobile Service Below 1 GHz and FDMA Non-geostationary Satellite Orbit (Non-GSO) Mobile Earth Stations) and Recommendation ITU-R M.1087 (Method for Evaluating Sharing Between Systems in the Land-Mobile Service and Spread-Spectrum LEO Systems in the MSS Below 1 GHz). These international recommendations use well defined analytical methods involving statistical approaches to indicate how narrow and wide band MSS systems can share spectrum with mobile users. Additional studies are considering the effects of retransmissions due to errors or noise on existing services and also the possible delays in channel access to existing services.

Narrow band FDMA systems use frequency agile band scanning techniques to find open channels prior to transmission. The channel is occupied for just the duration of the transmission and then released. In this manner, interference with active users may be minimized. Similarly, harmful interference may be minimized by wide band, spread spectrum systems. These have the ability to spread the signals over wide amounts of spectrum that results in very low interference levels for any particular narrow band channel. Typically, MSS systems below 1 GHz transmit small amounts of data. Market studies have shown that the large majority of potential users for this service such as the transportation tracking and utility monitoring markets need only 20 to 100 bytes of data transmitted a few times per day at most. If the duration of the transmissions are brief, they also minimize the use of the spectrum. This combination of channel avoidance, brief message lengths, and low output power density may facilitate sharing of spectrum with many existing users in some situations.

4.3. Candidate Frequency Bands

Based on these selection criteria, the following bands have been identified as candidates for shared. These bands include those that contain fixed and mobile services and also bands that have current secondary allocations for MSS.: Analytical and field studies as discussed above are currently in process to determine the ability of MSS systems to share with existing users.

1. 152.855 - 156.2475 MHz and 157.1875 - 173.2 MHz

2. 216 - 218 MHz and 219 - 220 MHz

3. 312-315 MHz and 387-390 MHz

4. 450-460 MHz

5. 470-512 MHz

Fixed and mobile services in many segments of these bands are heavily used by numerous services with large populations of users including as examples, private users, government users, public safety, industrial telemetry and control, maritime services, and allocations to amateur radio. However, the proponents of MSS systems believe that the sharing studies will identify band segments in these bands that are not uniformly used and that there may be a wide variation in the level of usage and numbers of licenses. Those segments having relatively few licenses, low levels of use, or where users have transitioned to other bands would be preferable for MSS below 1 GHz services.

The selection of the needed 7 to 10 MHz in these specific bands will be accomplished by detailed analysis of usage in the stated bands considering the existing systems' characteristics and the nature of the service. Consideration will also be given to frequencies identified as under consideration by other Administrations. For example, CITEL MSS proposals in the bands 138-144 MHz, 408-410 MHz, 410-420 MHz, and 420-423 MHz. These results should be the basis of field measurements that would validate the selection of the desired spectrum. Recommendations for the specific bands will be provided as a supplement to this report in the near future.

5.0 SHARING

Proponents of NGSO systems believe that FDMA/DCA or CDMA systems and variations of these will permit spectrum sharing with existing terrestrial services. This section describes how this would take place.

5.1 NGSO System Characteristics.

NGSO systems offer a world-wide land and sea low cost packet messaging service, enabling the monitoring of mobile, transportable and fixed facilities with small, low cost, convenient mobile earth station, "MES", transceivers. This world-wide service cannot be economically, practically or conveniently provided by either conventional terrestrial systems or by other satellite systems.

NGSO MSS services are limited to non-voice applications involving the transmission of short data packets between NGSO MES terminals on land and sea and NGSO satellites. The currently proposed NGSO MES Earth-to-space transmissions are limited to short durations, typically less than 0.5 seconds and typically are transmitted twice per day. The transmission duty cycle is small, typically less than 0.01 percent per NGSO MES terminal and by other constraints. The NGSO MES Earth-to-space transmissions are proposed in bands shared with terrestrial users, primarily fixed and mobile stations, thus spectrum sharing is a major consideration of the NGSO service.

Operating frequencies are constrained to be less than 1 GHz by the cost of the NGSO user earth stations and by the space link losses between the satellite and MES low gain antennas; link losses generally increase 6 dB per octave of operating frequency. Doppler frequencies at operating frequencies approaching 1 GHz also may be troublesome to the narrow band FDMA type systems.

An NGSO MES eirp is in the range of 1 to 10 watts, less than for typical terrestrial mobile or fixed stations.

Two generic transmission formats typify systems under consideration in the U.S., FDMA/Dynamic Channel Allocation, or FDMA/DCA and CDMA systems. In FDMA/DCA systems, the NGSO satellite scans the allocated NGSO MES Earth-to-space frequency band in order to identify instantaneously available channel-slots (i.e., channel-slots not containing a terrestrial transmission). NGSO MES transmissions are initiated only in channel-slots not in use by terrestrial users. An NGSO MES scheduled to communicate then is commanded via the NGSO space-to-Earth downlink, to transmit its packet in the identified idle channel-slot. In most cases, the NGSO packet transmission will be completed before any terrestrial user in that channel-slot will attempt to use that channel-slot. Interference between the terrestrial and space service occurs only if a terrestrial service user, previously idle, initiates a transmission in the idle channel-slot before the NGSO packet transmission (typically less than 0.5 seconds) is completed. In this case the NGSO packet transmission is destroyed and the packet must be repeated. Also the terrestrial system experiences an instantaneous transmission impairment caused by the interfering NGSO transmission, however terrestrial transmission continues thereafter without interference after the NGSO packet transmission is completed. Thus the possibility of mutual interference is limited to the duration of an NGSO packet, during the time when a terrestrial user, previously idle, is attempting a call or message.

In CDMA, each NGSO MES Earth-to-space uplink transmission is spread, typically over 1 MHz, by a direct sequence CDMA spreader, greatly reducing the interfering power density received by a terrestrial receiver operating in one of the channels encompassed by the spreading. The combination of the number of NGSO channels transmitted and the spreading typically will reduce the power received per terrestrial channel by something in the range of 20 to 25 dB. However, all active terrestrial channels within range of the NGSO MES and co-channel with the spread spectrum will experience this reduced-level interference burst. The interference received from terrestrial systems by NGSO CDMA systems is based on the received power averaged over the spread bandwidth.

The field of view of an NGSO satellite can be quite large ranging from the 48 contiguous states to North America, depending on the altitude and minimum elevation angle selected by the various proponents. Thus, any given field of view would "see" many independent mobile transmitter at any given time. A channel would be considered vacant only if unoccupied by a mobile transmission throughout the entire field of view. In practice this will be accomplished by setting criteria by which a given channel would be presumed to be unoccupied by a mobile user. The design of the NGSO systems, FDMA or CDMA, and the various sharing criteria, must include these considerations.

5.2 Terrestrial Systems Characteristics. Terrestrial mobile radio voice systems operating in bands proposed to be shared with the NGSO service operate in the push-to-talk voice dispatch mode, trunking mode, data exchange mode and other modes. Terrestrial mobile radio systems providing digital data exchange use error detection (and repeat request) and forward error correction schemes in order to assure reliable and correct data transmission despite propagation anomalies. Not all communications modes are equally shareable and individual channel loading is an important consideration particularly for the FDMA/DCA systems. These considerations ought to be included any sharing criteria and sharing plan.

Propagation distances are large compared to the higher frequency bands and the services have demonstrated high utility. However, these bands are subject to a number of inherent performance limitations which are important to consider when weighing the possible added interference or inconvenience caused by spectrum sharing with the NGSO service. The nominal terrestrial service area has locations and areas where service is severely limited or impossible. Multipath fading caused by nearby reflections from buildings and hills also can be severe. Foliage attenuation can be substantial. Non-service due to these effects is common.

These bands also are subject to urban noise, including impulse noise primarily generated by industrial equipment and carried long distances by telephone and power wires and by galactic noise. In addition the push to talk operation and certain data operations often result in channel contention by two parties seeking to operate the channel at the same time, causing an interruption in communications.

Interference from systems operating in adjacent areas are sometimes experienced at the fringe of the operating area. Thus, while these bands, generally, are heavily used and are of high utility, they are already subject to significant performance impairments.

5.3 Conclusions. FDMA/DCA NGSO systems may not interfere with terrestrial channels because the band scanning performed by the satellites would not identify these channels for use. The FDMA/DCA systems are expected to identify only channels which are lightly or moderately used. Thus spectrum sharing with NGSO systems would increase the spectrum efficiency of these channels.

CDMA NGSO systems are expected to cause some interference in all channels within its spread bandwidth, however the interference per channel is reduced by the spreading, typically of the order of 20 dB to 25 dB. Again, spectrum sharing with NGSO systems will increase the spectrum efficiency of these channels.

In summary, proponents of NGSO systems believe that FDMA/DCA or CDMA systems and variations of these will permit spectrum sharing with existing terrestrial services. For this reason the proponents of NGSO systems have begun rigorous spectrum studies to identify the most suitable bands and channels. The results of the studies described in Section 4.3 to indicate this possibility will be forwarded to the Commission when completed.

6.0 International Views

This section concerns the views of other countries as derived from participation in the CITEL, and CPM meetings. These views reflect those from CEPT, CITEL, Canada, Japan, and informal discussions with other countries.

6.1 CEPT

It is known that there is interest in "Little LEO" among the CEPT countries. They are willing to some extent improve the constraints on existing allocations and to a limited extent accept a small additional allocation, 399.9-400.00 MHz. However, there is no indication of support for additional spectrum although the CPM endorsed the requirement for an additional 7-10 MHz. Of concern is a draft CEPT proposal to change the -125 dBW/M^2/4 Hz trigger for coordination in FN599A to -140 dBW/M^2/4 KHz. This appears to be an initiative of French aeronautical radionavigation services operating in accordance with Footnotes 596 and 598. Aside from a simplistic calculation, which takes account of no sharing techniques, there is no justification for this number. The recently completed CPM-95 endorses the -125 dBW/m^2/4 KHz threshold.

6.2 CANADA

Canada is generally supportive of the U.S. approach to improving the constraints on existing MSS allocations.

6.3 CITEL

The recent meeting of CITEL III held several days of sessions on WRC-95 proposals. A Draft document was prepared as a basis for considering coordination of CITEL member views. These views were based on input from Canada, the U.S., Mexico, and Venezuela. (A copy is at Annex 3)

6.4 CPM-95

The CPM-95 generally endorsed the U.S. proposals, and the text already contained in the Draft CPM report. These include:

(1) Replacement of the -150 dBW/m^2/4 KHz limit in RR 608A,

(2) Endorsement of the -125 dBW/m^2/4 KHz limit in FN 599A,

(3) Modification of Land Mobile to Mobile in several Footnotes,

(4) Endorsement of the requirement for 7-10 MHz of additional spectrum in the near future.

6.5 Other

From informal discussions it is understood that Russia may not oppose U.S. proposals; Japan's preliminary proposals express not view.

In general since WARC-92 there has grown a greater interest in Little LEO's. However, the availability of additional spectrum will depend on making a convincing argument for the sharing of the spectrum of interest.

7.0 Proposals for NGSO MSS

Agenda 2.1(a) and 3.0(d) provide for the consideration of constraints on existing allocations and the adoption of limited MSS allocations if necessary, below 3 GHz. Industry Advisory Committee Proposals for MSS below 1 GHz for these agenda items are addressed below.

7.1 Allocations

A review of the MSS allocation below 1 GHz indicate areas where several proposals should be made too improve the usefulness of existing allocations for the MSS below 1 GHz. These are described on a band by band basis.

7.1.1 Revisions to Existing Allocations

7.1.1.1 137-138 MHz

MHz

137.175 - 138

Allocation to Services		
Region 1	Region 2	Region 3
137.175 - 137.825	~~SPACE OPERATION (space to Earth) METEOROLOGICAL SATELLITE (space to Earth) SPACE RESEARCH (space to Earth)~~ Mobile Satellite (space-to-Earth) 599B Fixed Mobile except aeronautical mobile (R) 596 597 598 599 599A	

ADD FN XXX: METEOROLOGICAL SATELLITE TO BE CO-PRIMARY UNTIL 1 JANUARY 2006, AND SECONDARY UNTIL 1 JANUARY 2010 TO PROTECT CONTINUING OPERATIONS (U.S. Gov't Suggestion).

7.1.1.2 149.9-150.05 MHz

The land mobile satellite service allocation in this band should be changed to a generic MSS allocation.

MOD

MHz

148 - 150.05

Allocation to Services		
Region 1	Region 2	Region 3
148-149.9 FIXED MOBILE except aeronautical mobile (R) MOBILE-SATELLITE (Earth-to-space) 599B	148-149.9 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 599B	
149.9-150.05		RADIONAVIGATION-SATELLITE ~~LAND~~ MOBILE-SATELLITE (Earth-to-space) 599B 609B 608B 609 609A

CC0105

Reason: The Land Mobile Satellite allocation should be made generic, like the others to allow for maximum flexibility in system implementation.

7.1.1.3 608B/609B

The text in these footnotes should be changed to read as follows:

609B

WARC-92 In the band 149.9-150.05 MHz, the allocation to the ~~land~~ mobile-satellite service shall be on a secondary basis until 1 January 1997.

Reason: The removal of -150 dB(W/m^2/4kHz) in FN 608B reflects the fact that there are no fixed or mobile services in this band. The removal of land in both Footnotes reflects the proposal in 7.1.1.2.

7.1.2 ADDITIONAL ALLOCATIONS

The IWG-2 group identified potential frequency bands for additional allocation to the NGSO MSS service in section 4.1. The IWG-2 recommendation for additional spectrum includes only those bands within the "Priority One" category as follows:

7.1.2.1 399.9-400.05 MHz

MOD MHz

399.9-400.05

Allocation to Services		
Regions 1	Region 2	Region 3
399.9-400.05 RADIONAVIGATION SATELLITE MOBILE SATELLITE (Earth-to-space) 609 645B 599B 608Y		

Add FN XXX: The Mobile Satellite service will be limited to non-voice, non-geostationary satellite systems in the in the 390-399.9 MHz portion of this band. Footnotes 599B and 608X (as amended to include the additional bands allocated to the Mobile Satellite service) apply to the operation of the NGSO MSS services in this band.

Note: Footnotes 599B, 608Y must be amended to include the 399.9-400.05 MHz band.

REASON: The transit system is being phased out of this band making it available for an MSS allocation.

7.1.2.2

In Section 4 IWG2 identified a list of candidate frequency bands for additional MSS below 1 GHz allocations. The specific bands to be selected for proposals are to be determined by subsequent analyses. Below is the format to be used in the proposals for those frequencies selected from the candidate bands.

MOD

<table>
<tr><th colspan="3">ALLOCATION TO SERVICES</th></tr>
<tr><th>Region 1</th><th>Region 2</th><th>Region 3</th></tr>
<tr><td colspan="3">[ ] MHz
MOBILE SATELLITE SERVICE
(Space-to-Earth)
599A 599B</td></tr>
<tr><td colspan="3">[ ] MHz
MOBILE SATELLITE SERVICE
(Earth-to-Space)
599A 599B 608X</td></tr>
</table>

Note: Footnotes 599A, 599B and 608X must be amended to include these bands.

Reason: Sharing techniques of NGSO-MSS systems below 1 GHz have demonstrated the possibility of sharing with these services in these bands.

7.2 Sharing Criteria

7.2.1 Existing Allocations

a. MOD 608A

The use of the band 148-149.9 MHz by the Mobile-satellite service is subject to the application of the coordination and notification procedures set forth in Resolution 46 (~~WARC-92~~, WRC-95). The mobile-satellite service shall not constrain the development and use of fixed, mobile and space operation services in the band 148-149.9 MHz. ~~Mobile earth stations in the mobile satellite service shall not produce a power flux density in excess of -150 dB(W/m$_2$/4KHz) outside national boundaries.~~ Mobile earth stations in the mobile satellite service shall coordinate outside national boundaries through use of the coordination distance threshold method indicated in Appendix ZZZ. [ITU-R Draft Recommendation (Doc. 8/46)].

b. ADD Appendix ZZZ

This Appendix is Draft ITU-R Recommendation Doc. 8/46.

REASON:

The -150 dBW/M^2/4Kz limit was determined by the CPM-95 to be unworkable, and should be replaced by the coordination distance threshold method indicated in Appendix ZZZ. This method is the subject of a Study Group 8 draft New Recommendation. If this Draft Recommendation were agreed by Study Group 8, and subsequently by the Radio Assembly it could be referenced in modified Footnote 608A instead of Appendix ZZZ. However, this is dependent on the action taken by WRC-95 on the question of referring to ITU-R Recommendations in the body of the Radio Regulations. If the WRC-95 does not agree to use of Recommendations by reference, then it will be necessary to include the substance of the method in the Radio Regulations much like Appendix 28.

c. For NGSO MSS systems below 1 GHz the coordination area for land stations is defined according to a Draft New Recommendation (Rec. (WP 8D/TEMP/46). This should be provided for in the modifications to Resolution 46.

d. MOD 608B

WARC-92

The use of the band 149.9-150.05 MHz by the ~~land~~ mobile-satellite service is subject to the application of the coordination and notification procedures set forth in Resolution **46 (WARC-92)**. The ~~land~~ mobile-satellite service shall not constrain the development and use of the radionavigation-satellite service in the band 149.9-150.05 MHz. ~~Land mobile earth stations of the land mobile satellite service shall not produce power flux density in excess of 150 dB(W/m^2/4 KHz) outside national boundaries.~~ Mobile earth stations in the mobile satellite service shall coordinate outside national boundaries through use of the coordination distance threshold method indicated in Appendix ZZZ. [ITU-R Draft Recommendation (Doc. 8/46)].

CCC110

Annex 1
Market Demand for MSS Data Services Below 1 GHz

An assessment of the market demand for MSS data services below 1 GHz is essential to defining the requirements for additional spectrum. Since the time that Task Group (TG) 8/3 reported on the need for additional MSS below 1 GHz spectrum allocations, more recent and comprehensive market analyses have been completed that supplement the conclusions of TG 8/3. While it was originally suggested that the capturable market for MSS below 1 GHz services would be about 6 million in North America by the year 2000, it is now clear that this early estimate was very conservative.

More recent marketing studies performed by CTA Commercial Systems, STARSYS, and Final Analysis Communications Services have analyzed this market and have found that the market exists in a number of segments that can be represented as:

- Utility Monitoring: This market segment consists of monitoring electric, gas, and water systems. MSS below 1 GHz systems lend themselves to this application due to their ability to effectively acquire data in remote, difficult to access locations.
- Transportation Asset Monitoring: The ability to locate the position valuable assets and provide status while in transit on land and sea can be a high value to transportation systems. Locating missing or stolen vehicles is also a high value service. MSS below 1 GHz systems with their capability to communicate with mobile users are ideally suited to service these applications.
- E-mail/Paging: MSS below 1 GHz systems can provide efficient, low cost one and two way messaging for normal and emergency communications in all geographic areas particularly in many situations while terrestrial services are not available or cost effective.
- Information Management: Low cost acquisition of data from remote sensor systems and the provision of consumer services such as credit card validation and direct to home sales.

Based on discussions with industry leaders, communications professionals, end users, and government officials, these studies indicate that a much larger aggregate market exists than was earlier predicted. The general results complied from a number of studies are presented below in Table 1 to indicate the scope of the market.

This study and others have reached similar conclusions that hundreds of millions potential users exist within North America alone. The capture of these users by MSS below 1 GHz is tempered by many factors including system implementation schedules, equipment and service pricing, quality of service, and the availability of competitive alternatives both terrestrial and other types of satellite systems. MSS proponent believe that with the consideration of the above factors, over 40 million users can be served by MSS below 1 GHz systems by the year 2000.

The spectrum requirements to meet this demand will depend on the recurrence of the data acquisition, on the size of the data messages, efficiencies of the transmissions, and on the number of sMSS systems serving those markets.

There are many perspectives on the market demand for these services. Although the specific market demand and capture potential may vary among the more recent market studies, one thing is clear. That is that the market demand is much larger than was originally conceived and that the TG 8/3 recommendation for an additional 7 to 10 MHz is justified. This additional allocation will allow a number of service providers to enter this market which in turn will result in lower costs and greater service options for the consumer.

Table 1. Market Demand for LEO Satellite Data Services

	U.S. Market Size		
	Total	% Capture	LEO Users
Utility			
Electric	200,000,000	10%	20,000,000
Water	80,000,000	10%	8,000,000
Oil Wells/Pipeline	2,000,000	10%	200,000
Gas	54,000,000	10%	5,400,000
Transportation			
Trucks	1,800,000	25%	450,000
Trailer	3,900,000	25%	975,000
Shipping	500,000	10%	50,000
Pleasure Boats	20,000,000	5%	1,000,000
Automobile/Theft Recovery	160,000,000	5%	8,000,000
Containers	880,000	20%	176,000
E-mail/Paging	20,000,000	2%	400,000
Information Management			
Buoys	5,000	25%	1,250
Field Sensors	500,000	25%	125,000
Direct TV/Credit Verification Services	15,000,000	25%	3,750,000
Total	558,585,000		48,527,250

INTERNATIONAL TELECOMMUNICATION UNION

RADIOCOMMUNICATION
STUDY GROUPS

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Working Party 8D

DRAFT NEW RECOMMENDATION

METHOD FOR DETERMINING COORDINATION DISTANCE BETWEEN GROUND BASED MOBILE EARTH STATIONS AND TERRESTRIAL STATIONS OPERATING IN THE 148.0 - 149.9 MHz BAND

The ITU-Radiocommunication Assembly,

considering

a) that the use of the 148.0 - 149.9 MHz frequency band is subject to RR 608A;

b) that mobile earth stations in the mobile-satellite service operating below 1 GHz will, typically, operate with e.i.r.p.s of 10 dBW or less;

c) that the mobile earth stations may typically be located anywhere within an administration implementing such a service;

d) that the land earth stations in the MSS operating below 1 GHz will use higher e.i.r.p.s than the mobile earth stations and will be at fixed locations;

e) that some administrations may choose to implement only mobile earth stations;

f) that coordination of mobile earth stations is inherently different from the coordination of land earth stations,

recommends

1 that the method described in Annex 1 be used to calculate a coordination distance identifying administrations that may be affected;

2 that the method take account of the actual parameters of terrestrial stations;

3 that the method be used in conjunction with procedures of Resolution No.46 of the Radio Regulations relating to coordination between mobile earth stations and terrestrial stations.

CC0113

ANNEX 1

Method for determining the coordination distance between ground based mobile earth stations and terrestrial stations

The method of calculation of a coordination distance between a mobile earth station and a terrestrial station is based on determining the distance, on the surface of the Earth, that will provide sufficient isolation between the mobile earth station transmitter and the terrestrial receiver such that a terrestrial receiver lying beyond the coordination distance will have a very low probability of receiving interference from the mobile earth station. The coordination distance calculation is based on the troposcatter propagation section of Recommendation ITU-R PN.452-5, "Prediction procedure for the evaluation of microwave interference between stations on the surface of the Earth at frequencies above about 0.7 GHz". The troposcatter propagation mechanism provides a relatively large distance in comparison to other propagation mechanisms and, therefore, can be used as a conservative estimate of the coordination distance between the two systems. Specifically, the propagation loss (LRequired) in Figure 1 is based on equation 10a of Recommendation ITU-R PN.452-5. Among the simplifying assumptions used to derive Figure 1 are:

- the frequency is 148 MHz;
- no site shields exist for either transmitter or receiver;
- the propagation loss will be exceeded for 99.9% of the time.

The method first calculates the required loss between the mobile earth station and a terrestrial receiver as shown in equation (1):

$$LRequired = (Pt + Gt + 36.0) - (Ir - Gr + Lr) \qquad (1)$$

where :

LRequired	=	required threshold loss between the transmitter and receiver (dB)
Ir	=	terrestrial receiver permissible interference referenced to a 4 kHz bandwidth (dBW/4 kHz)
Lr	=	line losses between the terrestrial receiver and antenna (dB)
Gr	=	maximum antenna gain of terrestrial receiver (dBi)
Pt	=	maximum power density of the mobile earth station (dBW/Hz)
Gt	=	maximum antenna gain of the mobile earth station (dBi)

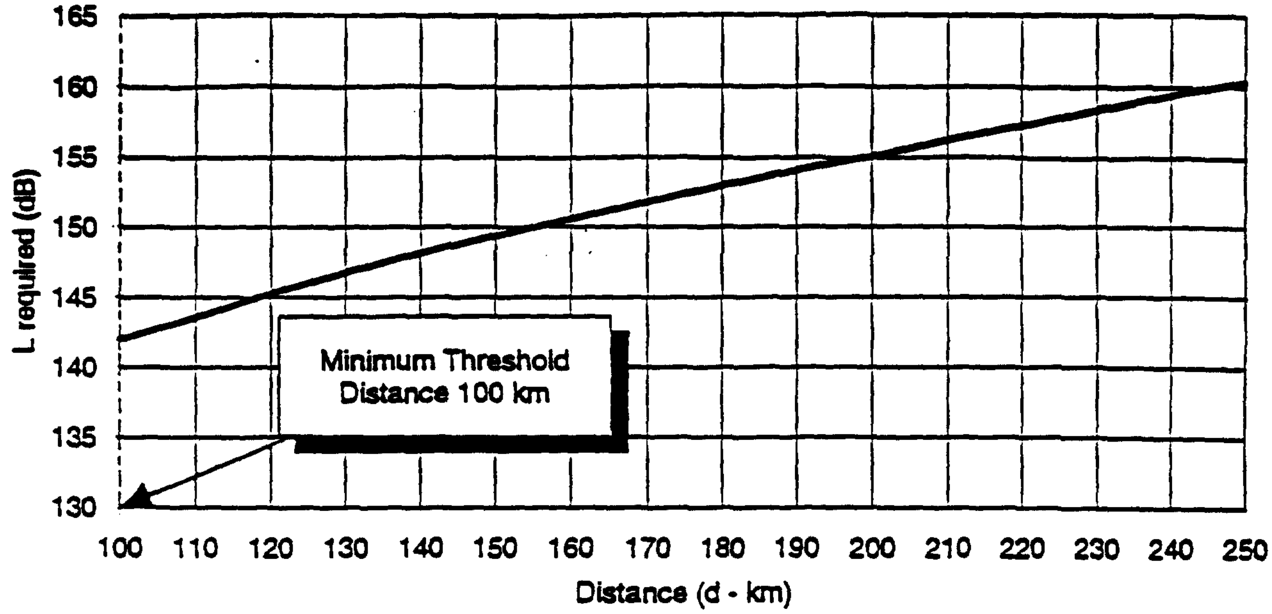
The values of Pt and Gt, for the mobile earth station, are available in the information supplied under Section II of the Annex of Resolution No. 46. The values for Ir, Gr, and Lr will be provided by the administration that may be affected.

Figure. 1 is then used to determine the coordination distance. Figure. 1 is used by entering the required LRequired on the ordinate and reading the corresponding distance (d in km) on the abscissa. A minimum coordination distance of 100 km should be used.

Examples of the application of this method are shown in the Appendix 1.

FIGURE 1

MES/TERRESTRIAL STATION COORDINATION DISTANCE



The generating equation for Figure. 1 is :

$$L_{Required}(d) = 95.47 + 20*\log(d) + 0.0674*d \text{ (dB)}$$

where: d = distance (km) and

$L_{Required}$ = is the intersystem loss required, in dB, that can be expected to be exceeded for 99.9% of the time

APPENDIX 1

Example of determination of coordination distance

Two examples of the use of the coordination distance calculation method are provided in this Appendix. Example 1 represents a narrow-band MSS system and example 2 a wideband MSS system.

TABLE 1

Coordination distance examples

	Example 1 Narrow-band MSS	Example 2 Wideband MSS	
MSS system information			
MSS maximum power density	-27.0	-56.3	dBW*
MSS maximum isotropic gain	2.0	0.0	dBi*
Conversion to 4 kHz bandwidth	36.0	36.0	dB
MSS e.i.r.p. density	11.0	-20.3	dBW/4 kHz
Mobile system information			
Example terrestrial receiver permissible interference level	-140.0	-140.0	dBW/4 kHz
Example terrestrial line losses	-1.0	-1.0	dB
Example terrestrial antenna gain	5.0	5.0	dBi
Terrestrial receiver permissible interference level @ antenna	-144.0	-144.0	dBW/4 kHz
Required isolation ($L_{Required}$)	155.0 dB	123.7	dB
Coordination distance from Figure. 1	200 km	100**	km

* Information supplied in accordance with Section II of the Annex of Resolution No.46.

** Minimum coordination distance is 100 km.

FCC INDUSTRY ADVISORY COMMITTEE

FOR THE

ITU 1995 WORLD RADIO COMMUNICATION CONFERENCE

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FINAL REPORT

OF

INFORMAL WORKING GROUP 3

~~~~

Warren G. Richards
Chair

Ben C. Fisher
Vice Chair

INFORMAL WORKING GROUP 3 - MOBILE SATELLITE SERVICE ABOVE 1 GHZ
Report
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MOBILE SATELLITE SERVICE ABOVE 1 GHz

3.0 Introduction

Interim Working Group 3 was established by the FCC Industry Advisory Committee for the ITU 1995 World Radiocommunication Conference at its organizational meeting on May 31, 1994.

The terms of reference of IWG-3 are to draft and justify, for consideration by the Committee as a whole, recommendations for U.S. proposals and positions related to:

(1) spectrum requirements for the mobile-satellite service between 1-3 GHz;

(2) additional frequency bands that could be allocated to MSS between 1-3 GHz;

(3) technical and operational constraints associated with the presently and potentially allocated frequency bands between 1 and 3 GHz to MSS with a view toward facilitating the use of these bands;

(4) addition(s) to/modification(s) of the relevant Radio Regulations;

(5) resolutions and recommendations of World Administrative Radio Conferences which are relevant to (1), (2) and (3) above.

The recommendations for U.S. proposals are to be supported by text which indicates (a) the amount and basis for determination, of spectrum needed for MSS between 1 and 3 GHz; (b) the placement in the spectrum of additional MSS allocations; (c) the unmet spectrum requirements for MSS service links between 1 and 3 GHz, if any; (d) the appropriate sharing criteria, if sharing with other services is required; (e) the time frame associated with any unmet spectrum requirements and any reaccommodation that may be required of existing services; and (f) any consequential changes needed to the international Radio regulations in order to implement the suggested changes/allocations.

Mr. Warren G. Richards was appointed Chairman of IWG-3; Mr. Ben Fisher was appointed Vice-Chairman and Ms. Cecily C. Holiday was the Designated Federal Officer.

The IWG-3 work program consists of the following items:

Agenda Item 2.1 (a)

Allocated Spectrum. The informal working group is to evaluate technical constraints on spectrum allocated to MSS Between 1-3 GHz on a primary and secondary basis (specifically 1492-1525 MHz, 1610-1626.5 MHz, 1675-1710 MHz, 1970-2010 MHz, 2160-2200 MHz, 2483.5- 2500 MHz, 2500-2535 MHz, and 2655-2690 MHz) with a view toward enhancing its use